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LIST OF FOSSIL PLANTS COLLECTED IN THE VICINITY OF ONAGA, KAN.

By F. F. CREVECŒUR, Onaga, Kan.

Read (by title) before the Academy, at Topeka, January 2, 1903.

AS a list of fossil plants without any information as to the horizon from which they were collected would be of but little value, the following geological notes are submitted.

Accepting the Cottonwood Falls limestone as the dividing line separating the Permian from the Carboniferous, we have in Mill Creek township, in which the town of Onaga is situated, only the outcrops of the highest horizons of the latter formation. The Vermillion river with its tributaries has cut a deep trench from north to south through near the middle of the township and removed all trace of the Cottonwood Falls series of limestone from within the township, but the latter outcrops near by, in the next township west (Lone Tree), and a remnant remains on the hill in Lincoln township, about twenty rods east of the southeast corner of Mill Creek township.

The Eskridge shale, the highest series of the Carboniferous, with its underlying Neva limestone, exist only as remnants in the northeast and southeast corners of the township.

Below the Neva limestone, as measured in a section (fig. 1), along the south side of the southeast quarter of section 2, township 6, range 11, there exists a series of yellowish, ferruginous shales of a thickness of forty-five feet eight inches. This is 10 in figure 1, and is the horizon bearing the fossil plants so far collected.

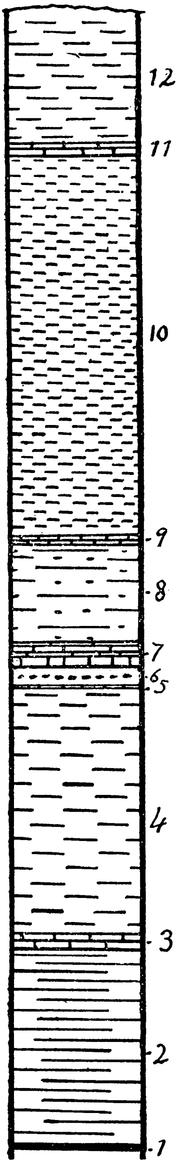
Next below this is a limestone (9 in our section), consisting of two layers each nine inches thick. The upper layer weathers into whitish angular fragments, which once seen are easily recognized, and forms a horizon easily traced and from which others may be identified. Below this limestone is a stratum of dark blue shale eleven and one-half feet thick. This shale (No. 8) becomes much lighter colored by exposure.

Next below this shale occurs a series of limestones (No. 7) which, from an economical standpoint, we consider worthy of a designation, and from its occurring over most of the township and within the limits of the town of Onaga, where it has been extensively quarried for material of which some of the town's most substantial buildings have been built, we propose the name Onaga limestone. This, like the Neva limestone above, outcrops in bold bluffs, and consists of four layers. The first, or highest one, is a brown-colored stone five inches thick, and has its upper surface much pitted from decomposition where it comes in contact with the overlying bluish clay shale. The next layer is also brown, of a thickness of eight inches, and is much harder than any of the other layers of the series. Where deeply covered, these two layers merge into one. The third layer is a bluish-gray stone, six inches thick, and has both surfaces covered with a soft, light-colored coating, the result of decomposition. The fourth and last layer is a light blue stone eight inches thick. Its under surface is studded with bumps or prominences one to two or more inches high. The stone is the purest in lime of any of the limestones of this locality, and, with the layer above it, has, in an early day, been burned for this product to a considerable extent.

Below this series of limestones there is another stratum of dark blue shale (No. 4) thirty-three feet eight inches thick. Near the top, a foot or two below the overlying limestone, there is a thin seam of flinty limestone (No. 5), from two to four inches thick, which weathers into perfectly rectangular blocks. Both surfaces are remarkably smooth, and it would make nice flagging stone if it only was more plentiful. Near the base of the shale-bed mentioned above there occurs a stratum of purplish clay, which helps to identify the limestone at the base of the shale-bed. This limestone (No. 3) consists of a variable number of layers. As measured in our section just above the bed of the creek, it consists of eight inches of stone, underlain by four inches of shale, separating it from the next two underlying layers of limestone, each ten inches in thickness. This series of limestones weathers into cubical blocks, which form good material for bridge abutments.

Below this limestone (No. 3) are about twenty-three feet of dark shale, with a seam of coal at its base. This coal (No. 1) varies in thickness from

FIG. 1.



No. 1 is a seam of coal about ten inches thick. No. 2, about twenty-three feet, No. 4, thirty-one feet three inches, No. 6, two feet, and No. 8, eleven feet six inches, are dark-blue shales. These shales are much lighter colored in some other places. No. 10 is a yellowish shale, plant-bearing. No. 12 is the Eskridge shales. No. 3 is a stratum of limestone, twenty-eight inches. No. 5 is thin limestone, from two to four inches. No. 7 is the Onaga limestone, twenty-six inches. No. 9 is limestone, eighteen inches. No. 11 is Neva limestone, from two to four feet.

four inches, as found in wells in Onaga, to ten or more inches on French and Mound creeks, in this township, and on Coal creek, in Grant township, to the east. In places the coal is overlain with a dark, tough stone about six or seven inches thick.

The different limestone strata contain fossils in varying abundance. The Neva limestone usually has its surface covered with numerous *Fusulina cylindrica*, half an inch to a quarter of an inch long. Limestones Nos. 3, 5 and 9 do not as a rule contain many fossils, but No. 7, the Onaga limestone, has many fossils, consisting of species of *Lophophyllum*, *Productus*, *Enteletes*, *Pinna*, *Reticularia*, *Allorisma*, *Spirifer*, and many crinoid stems. Fossils, with one exception, have not been found in any of the shales. In a well dug a mile south of where our section was measured, in shale-bed No. 10, and what we should judge to be near the base of the shales, there were found many specimens of a species of a *Productus*. It is in this bed of shales, as has already been mentioned, that our fossil plants occur. In several wells sunk about a dozen rods west of the quarter stone on the south side of section 2, township 6, and range 11, numerous plant remains have been unearthed at a depth of from seven to eighteen feet. A quarter of a mile north of the above-mentioned corner-stone, while digging a pond, quite a number of species were also collected, but in less numbers than at the first-named locality. The species collected at the wells consist of the following:

1. *Mariopteris;* probably *M. cordato-ovata* Weiss. var. *obtusa*.
2. *Odontopteris;* probably *O.* (*Lescuropteris*) *moori* (Lx.) Dw.
3. *Daubreea;* perhaps two species.
4. *Neuropteris scheuchzeri* Hoffm.; a variety not yet described.

Besides these there are a number of others not yet identified. At the pond were collected the following species:

5. *Annularia stellata* (Schloth.) Wood; narrow form.
6. *Asterophyllites equisetiformis* (Schloth.) Brongnard.
7. *Neuropteris odontopteroides* F. & W.?
8. *Neuropteris plicata* Sternberg; as applied by Lesquereux.
9. *Neuropteris scheuchzeri* Hoffm.; same as No. 4.
10. *Neuropteris* sp.; apparently a new form.
11. *Odontopteris brardii* Brongn.
12. *Pecopteris hemiteloides* Brongn.
13. *Pecopteris newberriana* F. & W.
14. *Pecopteris oreopteridia?* (Schloth.) Brongn.
15. *Radicites capillarens* (L. & H.) Pat.

Of the species collected at the pond, Nos. 5, 6, 11 and 15 were not recognized at the wells, though species, which may be forms of Nos. 5 and 8, were also found at the last localities. Also, the species of *Daubreeas* which occur at the wells were not seen at the pond.

It was ascertained that the outcrops of the different strata on the east side of the creek occur at practically the same level as on the west side. Supposing them to be continuous over the territory studied, where not removed by erosion, the Neva limestone should have been found at a depth of four and a half feet in the last well dug near the quarter section-corner. Instead, the underlying shales outcrop at the surface and plant remains were first met with at a depth of seven feet, or just beneath the level of the under surface of the Neva limestone series, should this have been continuous. The yellow shale continues at this place to a depth of eighteen or nineteen feet, when it is replaced by the blue shale, which should not be encountered until a depth of about fifty feet. This shows that the shales underlying the Neva limestone were deposited to a greater thickness at this locality than elsewhere in this territory, thus forming conditions inimical to the deposition of the Neva limestone at this place. The different strata of shales are considerable arched, and tend to show that this immediate locality was above water while Neva limestone was deposited, and that the latter was laid down in comparatively shallow water.

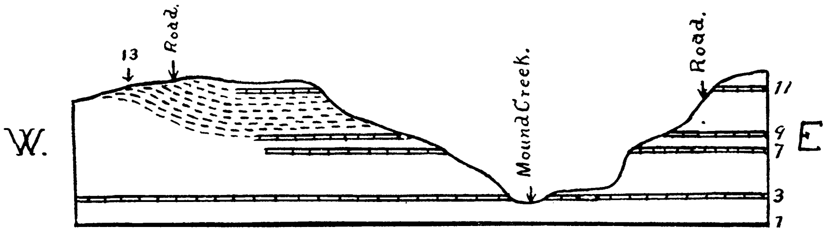


FIG. 2.
Numbers at right correspond with those in fig. 1. No. 13 is one of the plant-bearing localities.

Figure 2 shows the uparching of the plant-bearing shales at 13, being the well mentioned above. This figure represents a horizontal section as measured at the locality for figure 1, and extends for a little over a half-mile east and west across Mound creek. Another well was dug some years ago about thirty rods north of the well shown at 13, figure 2. The surface at this well lies twenty-four feet below the surface of the well at 13 and was dug to a depth of twenty-two feet. Instead of the yellowish, clayey shale, which should have been encountered, there was at the surface eight feet of glacial till, with boulders, followed by eight feet of finely stratified sandy silt. Below this to the bottom of the well occurred cross-bedded sandstone, the higher horizons dipping to the west while those at the bottom of the well dip to the east. The blue shale was not reached in this well, but from another, dug lower down the slope, it was reached at a depth of about eighteen feet, or at its proper horizon.

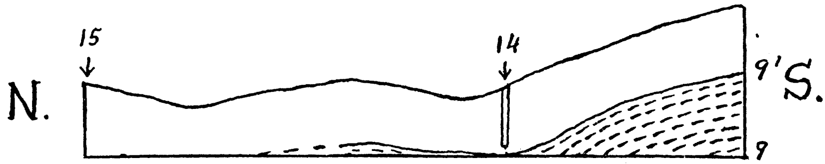


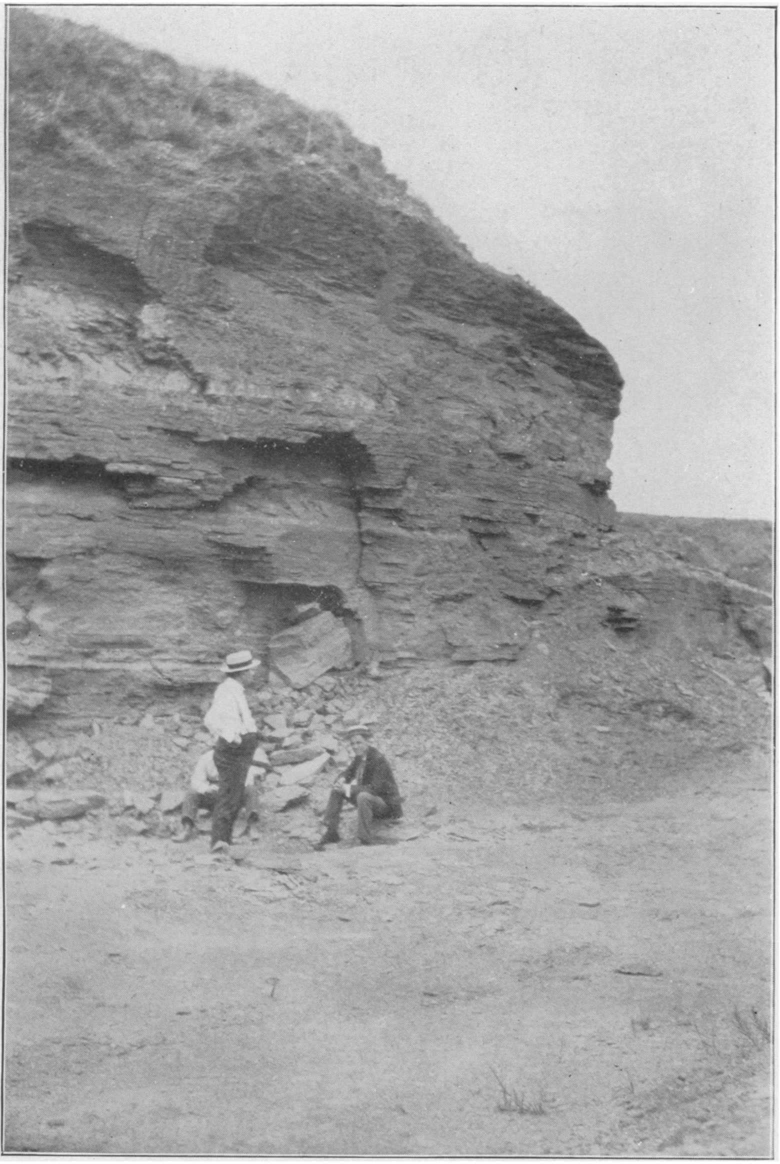
FIG. 3.

No. 9 represents the horizon at which limestone (No. 9, figs. 1 and 2) should appear. No. 9^1 represents the upper surface of the dark blue shales, which first make their appearance in the vicinity of limestone No. 9. No. 14 is a well twenty-two feet deep which did not reach the blue shale. No. 15 is the pond where fossil plants were found.

Figure 3 represents a north-and-south section, measured for a quarter of a mile north of the well shown at 13 (Fig. 2.) At 9 is shown the horizon at which the blue shale should be first met with, while at 9^1 is shown its upper surface as it actually exists. At 14 is shown the well which was dug through till and sandstone, in which the blue shale was not reached. At 15 is the pond in the bottom of which plant remains were found.

It was at first thought that the Americus limestone, as shown in Mr. Alva J. Smith's geological section across Lyon county, shown in the last volume of the Transactions of the Academy existed here, but a careful comparison of our section with Mr. Smith's of the strata immediately underlying the Cottonwood Falls limestone shows the two to be nearly identical, the differences consisting of greater thickness of the limestones in Lyon county, with the exception of our No. 9 (fig. 1), which is exactly the same thickness as the corresponding limestone in Lyon county, this being the second limestone below the Cottonwood Falls limestone in Mr. Smith's section, and the lesser development of the shales in that county. Mr. Smith's section does not show the seam of coal occurring at the bottom of our section, but the stone corresponding to the one just overlying our seam of coal is shown in an eight-inch seam in his section.

Acknowledgments are due to Dr. David White, of the National Museum, for the determination of the plants in this list, and to Dr. Geo. I. Adams, of the United States Geological Survey, and Mr. Alva J. Smith, of Emporia, for assistance in locating the strata of our section.



Shale Bank on the Smoky Hill River.